



# No-Tillage: From Bernese Cantonal Promotion To Swiss Federal Agricultural Policy

Wolfgang G. Sturny and Andreas Chervet

Soil Conservation Service, Canton of Berne, Ruetti-Zollikofen, Switzerland

Corresponding author: wolfgang.sturny@vol.be.ch



## Introduction

Since the late 1950s agricultural production on arable land has been strongly intensified. Switzerland is characterized by sloping and undulating areas as well as a cool and wet climate with annual precipitations of 1000 mm and more. Therefore, soil erosion is a major concern in arable farming. In addition, axle-loads of farm machinery have increased significantly during the last decade resulting in pronounced soil compaction and decreased soil quality. A strategy of action introducing a practicable cropping system, which combines the conservation of natural resources with economic benefits, was required. Conservation agriculture – in particular “zero tillage” based on Manitoban experiences from the early 1980s (Sturny, 1982) – fulfils both these criteria.

In the Canton of Berne, conservation tillage is being encouraged with financial incentives since 1993 (Schwarz et al., 2007) – including a farmer-to-farmer approach. Innovative private contractors made a valuable contribution to promoting no-tillage techniques among farmers. At the same time, countrywide awareness about no-tillage was successfully raised through consulting, publications, field trials and demonstration plots, field days as well as the national discussion platform SWISS NO-TILL (<http://www.no-till.ch>). The area under no-tillage increased constantly, reaching 17,000 ha or nearly 5% of the arable land (Schneider et al., 2010).

## Adoption of No-Tillage Practices

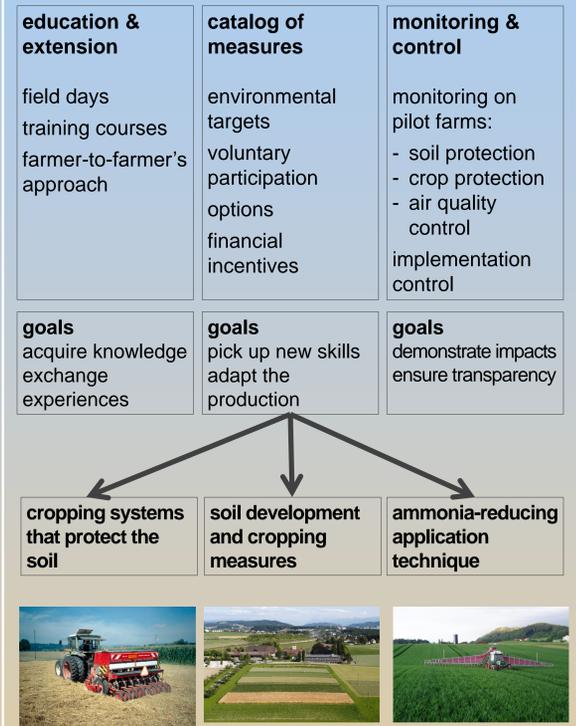


Substitution of non-selective herbicides: Winter wheat – using one-third of the seed density – and corn precision planting, respectively, directly into an established cover crop mixture: using or not a knife roller. The green manure plants freeze off in winter and provide a protection against soil erosion, pesticide runoff, and nitrate leaching, among others. A selective herbicide treatment in post-emergence will control hardy plants in spring.



## Soil Support Program

The Soil Support Program launched in 2009 is based on a three-pillar principle. Following completion of the program in 2015, the 11 measures should be economically feasible without additional incentives and be pursued further.



## Contributions

1996-2009

Implementation of the decree for the retention of life basics and cultural landscape in the Canton of Berne

Crops	mulch tillage (transition)	no-tillage (target)
	CHF ha <sup>-1</sup> yr <sup>-1</sup>	CHF ha <sup>-1</sup> yr <sup>-1</sup>
winter cereals	150	300
spring cereals	150	300
winter- / spring canola	300	500
corn (strip-tillage)	450	
corn (silage / grain)	300	500
potatoes	500	600
sugar / fodder beets	350	550
peas, soya / field beans	250	400
sown meadow / green fallow	0	200
sunflower	300	500

Farmers with the five year contract were committed to loosening their soils just superficially during the transition phase from a plow to a no-tillage system or to refrain from soil loosening by direct seeding or planting right away without any soil disturbance. Article 77a/b in the Federal Law on Agriculture establishes the provision of federal funds (80%) to supplement the cantonal incentives (20%) since 2008. The Canton of Berne therefore launched a 6-year “Soil Support Program” by farmers and soil experts to pursue a comprehensive and sustainable problem-solving approach to soil protection at the interface of water and air.

## Profitability / Sustainability

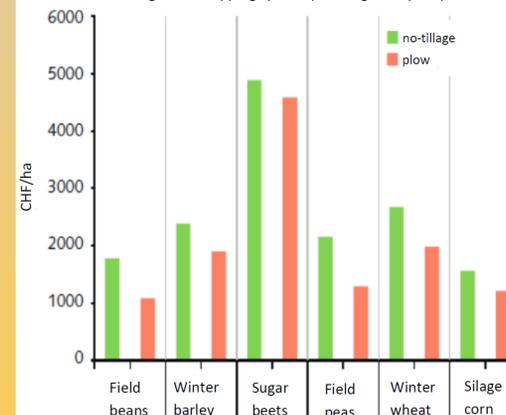
Average crop yields (1995–2014) in the Oberacker long-term field experiment. All crop yields are given in dt ha<sup>-1</sup> (cereals: 14% moisture content; legumes: 15% moisture content; maize: dry matter; potatoes: fresh weight) except for sugar beet yield, which is in Mg sugar ha<sup>-1</sup>. N: number of experimental years; NT: no-till; MP: mouldboard ploughing. Values followed by different letters are significantly different ( $p < 0.05$ ).

Crop	N	Yield NT	Yield MP	100 $\frac{Yield_{NT}}{Yield_{MP}}$
Winter barley	20	65.9 a	62.2 b	105.9
Sugar beet	20	11.5	11.9	96.6
Silage maize	20	199.9	198.7	100.6
Winter wheat	19	55.0 a	51.9 b	105.9
Spring peas	8	42.5 a	37.3 b	113.7
Spring field beans	6	30.9 a	26.3 b	117.3
Winter rye	6	59.5	58.6	101.5
Winter peas	5	32.1 a	26.6 b	120.9
Potatoes	5	341.1 b	399.5 a	85.4
Ley	2	n/a	n/a	n/a
Soybean	2	26.3	29.4	89.7
Winter field beans	1	23.6	29.0	81.2
Spring wheat	1	60.5	49.7	121.5
Average all crops				102.6

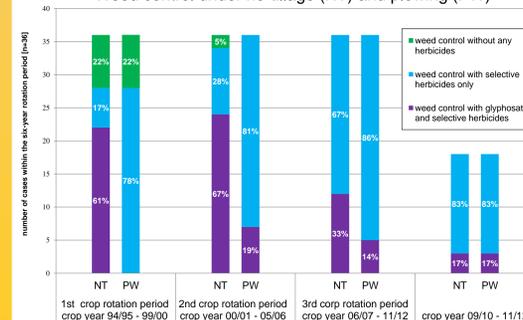
Yields and archived records of the field operations provide the basis for cost-effectiveness calculations. For each crop grown from 2009 to 2014, the direct costs (seed, fertilizer and plant protection products) as well as the machinery costs and the employment of third parties were compiled. Soil tillage, seeding, crop maintenance and harvesting are carried out with commercial machines by contractors. The profit margin I is obtained by subtracting the costs from the revenues. The profit margin II includes the profit margin I plus ecological contributions such as proof of ecological performance, extenso, resource efficiency and integrated production.

Both systems are being established further and optimized with regard to environmental sustainability and by significantly reducing the application of glyphosate (Sturny et al., 2007).

Average profit margin II (CHF/ha) of crops grown between 2009 and 2014 with regard to cropping system (no-tillage and plow).



Weed control under no-tillage (NT) and plowing (PW)



## Conclusion

➤ On a national level within the agricultural policy and the payments framework for 2014-2017, a new tool including “payments for efficient use of resources” was introduced in 2014 providing several measures derived from the Bernese incentive Soil Support Program.



## References

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